

U.S. Patent Application Serial No. 10/665,259
Amendment filed March 15, 2006
Reply to OA dated November 25, 2005

REMARKS

Claims 1-42 are pending in this application. Claims 1, 17, 19 and 31 are amended herein. Upon entry of this amendment, claims 1-42 will be pending. Entry of this amendment and reconsideration of the rejections are respectfully requested.

No new matter has been introduced by this Amendment. Support for the amendments to the claims is discussed below.

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. (Office action paragraph no. 1)

The objection to the title is respectfully traversed. Applicant respectfully notes that the Examiner does not state why he considers the title to be "not descriptive." Applicant also notes that the present title, "Semiconductor Light-Receiving Device," exactly matches the preamble of the claims, and Applicant submits that this title is appropriate for the present invention.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the p-n junction between the first semiconductor layer and the third semiconductor layer as stated in claims 2-3 must be shown or the feature(s) canceled from the claim(s). (Office action paragraph no. 2)

The objection to the drawings is respectfully traversed.

Applicant notes that the structure referred to in claims 2 and 3 corresponds to the disclosure

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of the specification on page 7, lines 28-33:

“A reverse bias is also applied to the n-p-n bypass diode 20 to form a depletion layer or a depletion region at the p-n junction between the contact layer 34 and the semiconductor layer 33. This depletion region functions as a capacitor.”

That is, the p-n junction referred to is between the contact layer 34 and the semiconductor layer 33.

Layers 34 and 33 are clearly illustrated in Fig. 1, and the junction appears as the interface between these layers. Figure 1 therefore **does** illustrate this element of the invention.

Claims 1, 17, & 31 are objected to because of informalities. (Office action paragraph no.4)

The objection is overcome by the amendments to claims 1, 17 and 31.

The Examiner states that all three claims refer to a “semiconductor layer” that is formed on a substrate and includes at least one semiconductor layer, stating that the wording seems awkward. The Examiner states that it is obvious that a semiconductor layer has a semiconductor layer, and it is vague as to how a substrate can have a first and second surface that faces each other.

In the amendments to claims 1, 17 and 31, the word “portion” has been inserted in the phrases “semiconductor layer portion of a first conductivity type” and “semiconductor layer portion of a second conductivity type”, thereby clarifying the issue of the “semiconductor layer”.

The term “facing” has been replaced with --opposite to--, for clarity. In addition, the recitation “formed on” has been replaced with --formed above--.

Moreover, for clarity, the phrase “interposed between” has been replaced in claims 1, 17 and

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31, with the direct recitation of the order of the layers in the recited structure. This amendment is made for clarity only, to clarify that the word “interposed” was only a structural term and was not a product-by-process limitation.

Claim 19 recites the limitation “potential” in claim 5. There is insufficient antecedent basis for this limitation in the claim. It will be assumed that claim 19 is instead dependent on claim 17. (Office action paragraph no. 5).

The objection is overcome by the amendment to claim 19. Claim 19 has been amended to depend from claim 17, and has been reworded for clarity by referring to the supplied potential as “a third potential”.

Claims 1, 4, 7, 10-12, & 14-15 are rejected under 35 U.S.C. §102(e) as being anticipated by Kakinuma (U.S. Patent No. 6,894,267 B2). (Office action paragraph no. 7)

The rejection is overcome by the amendment to claim 1. Claim 1 has been amended to recite that the first potential applied to the first semiconductor layer is higher than the third potential applied to the substrate. Support for this amendment may be found, for example, on page 7, lines 21-23, of the specification.

Thus, the first and third semiconductor layers (more specifically, the PN junction formed therebetween) are reverse-biased, so that a capacitor can be formed within the semiconductor light-receiving device.

Kakinuma fails to teach or suggest this limitation. The Examiner states that the n-type blocking layer 123 corresponds to the first semiconductor layer of claim 1, and the p-type blocking layer 117 corresponds to the third semiconductor layer. As pointed out by the Examiner, the electrode 140 is used to apply a voltage to the n-type blocking layer 123 (through the layers 113, 115 and 117). Thus, the PN junction between the layers 117 and 123 is **forward-biased**. Thus, no capacitor is substantially formed. In addition, the layer 117 is an N^+ layer and the layer 123 is a P^+ layer. Thus, the barrier formed by layers having high impurity concentrations is very low and is substantially in the conducting condition. If the PN junction between the layers 117 and 123 is reverse-biased, the upper diode with a voltage being applied to the electrode 150 will not operate.

Claims 2-3, 5-6, 13, & 16-30 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kakinuma (U.S. Patent No. 6,894,267 B2). (Office action paragraph no. 10)

The rejection of claims 2-3, 5-6, 13 and 16, is overcome by the amendment to the claim 1. The amendment to claim 1 in response to the rejection over Kakinuma is discussed above, and Applicant has argued that Kakinuma fails to suggest the limitations of claim 1, as amended.

The rejection of claims 17-30 is respectfully traversed. As noted above, claim 17 has been amended for clarity only, and the amendment to claim 17 does not change its scope.

Kakinuma fails to teach or suggest the use of a capacitor, as admitted by the Examiner. If the layers 117 and 123 form a capacitor, the upper and lower diodes do not work. As described above, the upper diode can operate by forward-biasing the PN junction of the layers 117 and 123.

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Kakinuma therefore does not suggest the limitations of claim 17.

Claims 31-42 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kakinuma in view of Kuhara et al. (U.S. Patent No. 6,043,550). (Office action paragraph no. 11)

The rejection is overcome by the amendment to claim 31. Support for the amendment to claim 31, reciting “wherein the first potential is higher than the reference potential,” may be found on page 7, lines 21-23, of the specification.

As amended, claim 31 recites that the first potential is higher than the reference potential. As pointed out by the Examiner, Kakinuma fails to teach or suggest the use of a dielectric layer. The Examiner relies on the antireflection layer 280 and the metallized ring 275 taught by Kuhara et al. However, Kuhara et al. fails to teach or suggest forming a capacitor by the antireflection layer 280 and the metallized layer 275. Further, Kakinuma does not suggest a capacitor built in the semiconductor device. Thus, there is no motivation to combine the teachings of Kakinuma with those of Kuhara et al.

In view of the aforementioned amendments and accompanying remarks, the claims, as amended, are in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the

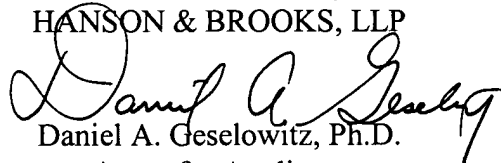
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Examiner is requested to contact the Applicant's undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, the Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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